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A Web-based Monitoring System for Barangay Projects with Integrated SMS and Email Notification Features

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Abstract: Project progress is significant and essential in today's generation which gives productivity to a various organization. It provides information on how well a project is advancing toward its objectives and goals. The Barangay Project Monitoring System sought to automate in Barangay Paraiso. It is defined as a system to monitor all ongoing and outgoing project information in the Barangay to avoid errors. Problems appear and occur due to inaccurate data and difficulty in monitoring. This study aims to design and build a system that provides information about the projects. An agile approach is used as a method, including planning, analysis, design, and implementation. The result of this study produces a Barangay Project Monitoring System that can monitor data for project planning, generate financial summary reports, track project progress or status, and also generate project monitoring reports for the Barangay to make it responsible and transparent. The system is expected to improve the accountability and transparency of barangay officials in managing community projects, promote community involvement in project monitoring, and provide an effective tool for decision-making and resource allocation. The quality of the system proves that it can make monitoring data easier, provide accurate project information, and record project details. The system included a variety of notable features, including Project Information, Project Details (Planning and Scheduling), Notification of Schedule and Deadline, Project Monitoring (Project Progress), and Backup Database, all of which add to the system's overall design. The software design used in this project was Agile Model it comprised of different phases. This encompassed requirement gathering, design of the requirement, development or iteration, testing, deployment, and review or feedback. The Barangay Hall, which is located at Purok Lowland, in Barangay Paraiso, Sagay City, Negros Occidental was the subject of this project.

Keywords: Web-based Project, Project Monitoring, SMS Notification, E-mail Notification, Software Application

INTRODUCTION

Project monitoring systems have become increasingly popular in recent years due to their ability to improve project management efficiency, communication, risk mitigation, decision-making, cost savings, and accountability.

The Project Monitoring System is accessible via a web browser, enabling monitoring and managing projects within the scope of works and expenditures. It is a tool created for both project managers and people responsible for the direction of the entire project portfolio in an organization.

The Barangay Hall, located at Purok Lowland, Barangay Paraiso, Sagay City, Negros Occidental, headed by the barangay captain, is one of the users who can access the Project Monitoring System. The barangay officials and employees

implement the projects' transparency to establish an accurate information report that is more consistent, efficient, and reliable as a source.

According to the barangay captain, Hon. Pepito M. Flores a system is needed to monitor data for project planning, financial reports, and project progress that is more responsible and transparent. That is one of the problems and the most needed to be implemented for more projects to be built in Barangay Paraiso.

When problems inevitably arise, a quick and effective solution can be implemented, and to avoid that problem, we, the researchers, proposed a system that will help them monitor the records accurately and efficiently.

The researchers aimed to develop a Barangay Project Monitoring System to help the barangay improve and build their projects' monitoring system to monitor all the records. The system will perform much better, especially for the barangay employees. Also, it incorporates the software applications and tools used to plan, organize, and manage complex projects. This proposal is vital and beneficial for the new systematic solution in the most crucial development system towards innovation.

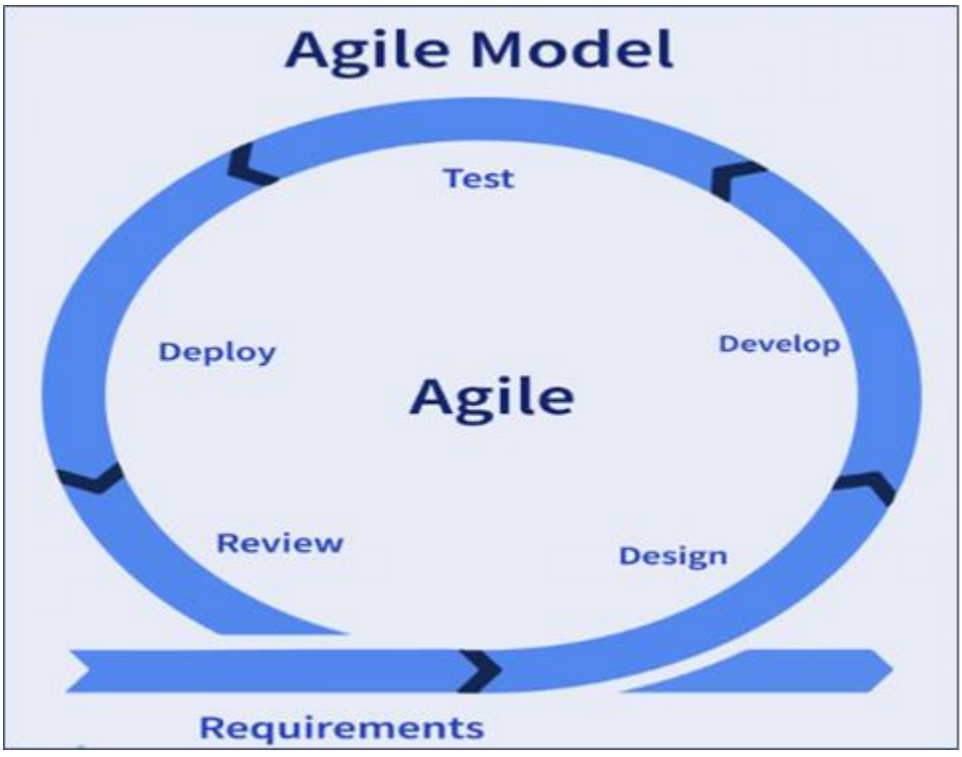
OBJECTIVES OF THE STUDY

Generally, this study aimed to develop a Barangay Project Monitoring System that will help barangay officials to efficiently monitor and track the progress of their community projects. The system's main goal is to provide transparency and accountability in managing projects by offering real-time updates on the project's status to both the barangay officials and the community members. To achieve its objective, the study specifically aimed to develop a system with several features such as (1) Project Information, (2) Project Details (Planning and Scheduling), (3) Notification of Schedule, Deadline, and Upcoming Projects, (4) Project Monitoring (Project Progress), and (5) Backup Database. These features will ensure that barangay officials can efficiently manage their projects and provide timely updates to the community. Furthermore, the system is also expected to generate essential reports that will help barangay officials make informed decisions. These reports include a List of Projects, Financial Summary Reports, and Project Monitoring Reports. These reports will help barangay officials track the use of resources, identify potential problems early on, and allocate resources effectively.

MATERIALS AND METHODS

This study used the descriptive developmental approach which is the systematic study of putting into design, developing, and carefully evaluating instructional programs, processes, and products that must meet the standard or criteria.

Figure 1. Agile Methodology



The agile approach was applied to come up with the proposed Barangay Project Monitoring System. The development stage of Agile includes requirement gathering, designing the requirement, development or iteration, testing, deployment, and review or feedback. (InterviewBit, 2021).

The researcher conducted the research in Barangay Paraiso, Sagay City, Negros Occidental. A data collection procedure was initiated for the development of the software. The survey questionnaire was personally distributed and administered by the researcher to the respective end users of the Barangay Hall. The respondents were given adequate time to answer the survey. Instruction was stated in the questionnaire for the respondents to answer each item. After a week, the researcher personally retrieved the questionnaires and tabulated and analyzed them. The researcher also interviewed to further evaluate the effectiveness and efficiency of the Barangay Project Monitoring System.

To simulate this model, software was developed to monitor the progress of the projects. This software was developed using PHP as its Server-side Scripting Language. HTML, CSS, and JavaScript were used for the front end, and MySQL for the database management system. Though these computer languages are commonly used for web applications, this system can operate locally using an Apache Server with PHP Interpreter and MySQL Database Server. To receive a notification of schedule, deadline, and upcoming projects, an SMS Gateway Software was used allowing end-users to receive SMS messages through the web application using API or Application Program Interface.

Figure 2. Main Dashboard of Developed System

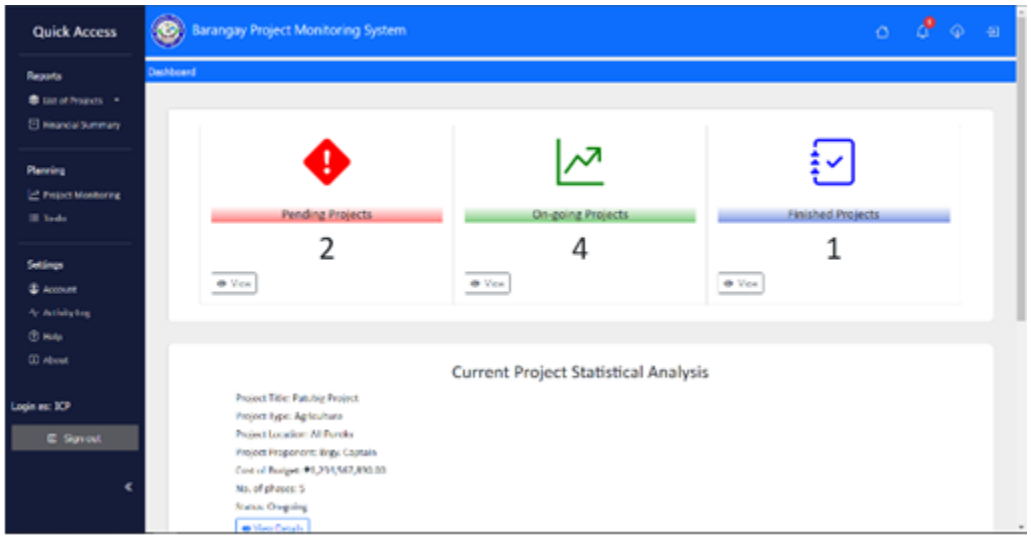
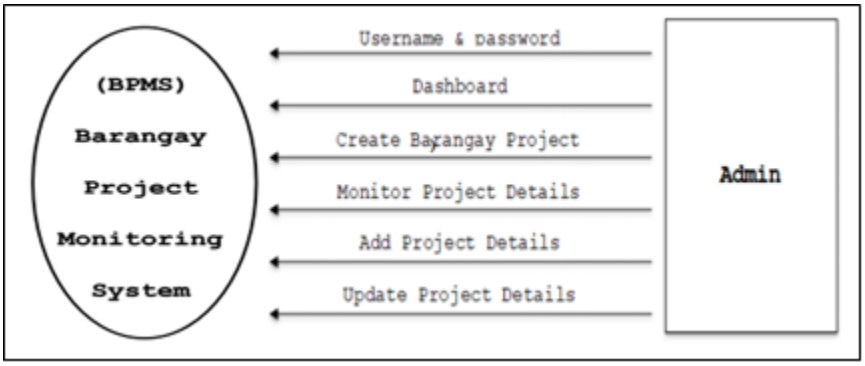


Figure 2 shows the web-based Barangay Project Monitoring System which can include adding/updating, viewing the list of pending, ongoing, and finished projects, generating a Financial Summary report, Project Monitoring Report, and Project Statistical Analysis.

Figure 3. Context Data Flow



The figure above showed the context data flow that illustrated the relationship between the system and its external entity, which in this case was the Admin.

Instrument

To initially determine the most appropriate tool or technology the community may use before starting the development of the system, the researcher developed a simple interview questionnaire. To determine the quality of the system, the researcher used the ISO/IEC 25010:2011 Systems and Software Quality Requirements and Evaluation (SQuaRE) Quality Model. Moreover, to determine the outcome of human interaction with the system, the researcher used another questionnaire to determine the usability of the proposed system in terms of usefulness, satisfaction, ease of use, and learning.

Evaluation and Respondents of the Study

During the initial data gathering, asked the Barangay Captain and 1 In charge personnel of Barangay Hall of Barangay Paraiso, Sagay City, Negros Occidental. The researcher used the Purposive Sampling Technique. It represents a group of different non-probability sampling techniques and relies on the judgment of the researchers when it comes to selecting the units that are to be studied. Usually, the sample being investigated is quite small, especially when compared with probability sampling techniques.

To evaluate the quality of the system using the characteristics described in ISO/IEC 25010:2011 Systems and Software Quality Requirements and Evaluation (SQuaRE) Quality Model, the researcher asks 4 IT experts to do the evaluation.

To evaluate the system based on Quality in Use, the researchers used purposive sampling. The researchers utilized Cronbach's alpha to measure the internal consistency of the instrument. The self-made questionnaire has undergone a reliability test from a group of fifteen (15) staff in Barangay Poblacion I, Sagay City, and a group of fifteen (15) staff in Barangay Poblacion II, Sagay City.

RESULTS AND DISCUSSION

On the system development side, the required features have been found available in the system. Upon testing the system must meet the desired objectives for implementation. Based on the data gathered from the respondents shown in Table 1, the overall result was 4 interpreted as Strongly Agree, and revealed the usability of the system.

Criteria	Respondent		Mean	Interpretation
	1	2		
In Terms of Monitoring the Project				
Provides easy access of monitoring prepared task through prepared schedule.	4	4	4	Strongly Agree
Efficient in monitoring prepared schedule.	4	4	4	Strongly Agree
Can determine the prepared schedule.	4	4	4	Strongly Agree
Can easily access on important activity logs already done by the incorporation.	4	4	4	Strongly Agree
Can send SMS to notify the in-charge personnel for the schedule, deadline and upcoming projects.	4	4	4	Strongly Agree
In Terms of Generating Reports.				
Is efficient in generating report.	4	4	4	Strongly Agree
Can generate reliable report.	4	4	4	Strongly Agree
Can generate report effectively.	4	4	4	Strongly Agree
GRAND MEAN			**4**	Strongly Agree

Table 1. Evaluation of respondents in terms of determining the usability of the proposed system in terms of monitoring the project and generating reports.

The table shows the result of the users' feedback on Barangay Project Monitoring System in terms of monitoring the projects and generating reports, the system has a grand mean of four point four (4) with an interpretation of Strongly Agree.

Criteria		Expert			Mean	Interpretation
		1	2	3		
Functional Suitability						
	Functional Completeness	5	5	5	5	Strongly Agree
	Functional Correctness	5	5	5	5	Strongly Agree
	Functional Appropriateness	5	5	5	5	Strongly Agree
Performance Efficiency						
	Time Behaviour	5	5	5	5	Strongly Agree
	Resource Utilization	5	5	5	5	Strongly Agree
	Capacity	5	5	5	5	Strongly Agree
Compatibility						
	Co-existence	5	5	5	5	Strongly Agree
	Interoperability	5	5	5	5	Strongly Agree
Usability						
	Appropriateness Recognizability	5	5	5	5	Strongly Agree
	Learnability	5	5	5	5	Strongly Agree
	Operability	5	5	5	5	Strongly Agree
	User Error Protection	5	5	5	5	Strongly Agree
	User interface Aesthetics	5	5	5	5	Strongly Agree
	Accessibility	5	5	5	5	Strongly Agree
Reliability						
	Availability	5	5	5	5	Strongly Agree
	Fault Tolerance	5	5	5	5	Strongly Agree
	Recoverability	5	5	5		Strongly Agree
Security						
	Confidentiality	5	5	5	5	Strongly Agree
	Integrity	5	5	5	5	Strongly Agree
	Non-repudiation	5	5	5	5	Strongly Agree
	Accountability	5	5	5	5	Strongly Agree
	Authenticity	5	5	5	5	Strongly Agree
Maintainability						
	Modularity	5	5	5	5	Strongly Agree
	Reusability	5	5	5	5	Strongly Agree
	Analysability	5	5	5	5	Strongly Agree
	Modifiability	5	5	5	5	Strongly Agree
	Testability	5	5	5	5	Strongly Agree
Portability						
	Adaptability	5	5	5	5	Strongly Agree
	Installability	5	5	5	5	Strongly Agree
	Replaceability	5	5	5	5	Strongly Agree
GRAND MEAN					**5**	**Strongly Agree**

Table 2. Evaluation of IT Experts in terms of determining the quality of the developed system based on ISO/IEC 25010:2011 Systems and Software Quality Requirements and Evaluation (SQuaRE) Quality Model.

The table shows the result of the IT Experts' feedback in determining the quality of the Smart Gardening System based on the characteristics set in the ISO/IEC 25010:2011 Systems

and Software Quality Requirements and Evaluation (SQuaRE) Quality Model.

Generally, in terms of determining the quality of the developed system based on ISO/IEC 25010:2011 Systems and Software Quality Requirements and Evaluation (SQuaRE) Quality Model, the system has a grand mean of five (5) with an interpretation of Strongly Agree.

CONCLUSION AND RECOMMENDATION

Based on the responses of the respondents as well as the system evaluation results both of the IT experts and the end-users, the overall result was very good. It implies that the Smart Gardening System meets the criteria for the software quality standards and the requirements of the end-users. The evaluation result of the IT experts clearly shows that the system is of Good Quality based on the characteristics set in ISO/IEC 25010:2011 Systems and Software Quality Requirements and Evaluation (SQuaRE) Quality Model. Further, the system was found useful based on determining the usability of the proposed system in terms of usefulness, satisfaction, ease of use, and learning. Therefore, the researchers conclude that the stated objectives of this study were met and were in line with the requirements and needs of the intended user.

The Barangay Project Monitoring System has several implications for barangay project monitoring and management. Improved project accountability and transparency is one of the system's primary advantages. With the system in place, barangay officials were able to more efficiently track project progress and respond quickly to any issues or delays. This contributed to project completion on time and within budget, as well as effective resource utilization. The SMS notification feature also increased transparency and communication by allowing stakeholders to receive real-time updates and provide feedback and suggestions for improvement.

To cope with the current advancement of technology and growth of the economy, Barangay Paraiso may consider implementing the develop system. This will also provide the cooperation with an efficient way to disseminate information to the other barangays when needed.

However, there are some difficulties and limitations to consider. The requirement for adequate technical infrastructure and resources is one potential challenge. The system is dependent on technology, such as computers and mobile phones, which may not be available to all barangay officials and stakeholders. Furthermore, there may be costs associated with the system's development and maintenance, which could be a barrier to implementation in some barangays.

Overall, the Barangay Project Monitoring System has the potential to significantly improve barangay project monitoring and management by increasing accountability, transparency, and stakeholder engagement. However, to fully realize these benefits, it will be necessary to address the system's challenges and limitations, as well as to ensure that adequate technical infrastructure, resources, and training are in place.

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